

WHAT IS CLAIMED IS:

1. A sheet of a copper alloy having a high-mechanical strength, the copper alloy comprising 3.5 to
5 4.5% by mass of Ni, 0.7 to 1.0% by mass of Si, 0.01 to 0.20% by mass of Mg, 0.05 to 1.5% by mass of Sn, 0.2 to 1.5% by mass of Zn, and less than 0.005% by mass (including 0% by mass) of S, with the balance being made of Cu and inevitable impurities,
10 wherein the alloy has a tensile strength of 800 N/mm² or more, and
wherein the alloy has a stress relaxation ratio of 10% or less.
- 15 2. A sheet according to claim 1, wherein the copper alloy includes a crystal grain having a diameter from more than 0.001 mm to 0.025 mm.
- 20 3. A sheet according to claim 2, wherein the copper alloy has a ratio (a/b), between a longer diameter a of a crystal grain on a cross section parallel to a direction of final plastic working, and a longer diameter b of a crystal grain on a cross section perpendicular to the direction of final plastic working, of 1.5 or less,

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4. A sheet according to claim 3, wherein the ratio (a/b) is 0.8 or more.

5. A sheet according to claim 1, the copper alloy further comprising S at a content of less than 0.002% by mass.

6. A sheet according to claim 1, the copper alloy further comprising at least one selected from the group consisting of B, Fe, Zr, P, Mn, Ti, V, Pb, Bi and Al, at a total content of 0.01 to 0.5% by mass.

7. A sheet according to claim 1, the copper alloy further comprising at least one selected from the group consisting of Ag, Co and Cr, at a total amount of 0.005 to 2.0% by mass.

8. A sheet according to claim 1, the copper alloy further comprising Ag at an amount of 0.005 to 0.3% by mass.

9. A sheet according to claim 1, the copper alloy further comprising Co at an amount of 0.005 to 2.0% by mass.

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10. A sheet according to claim 1, the copper alloy further comprising Cr, at an amount of 0.005 to 0.2% by mass.

5 11. A sheet according to claim 1, wherein the copper alloy is overaged.

12. A sheet according to claim 1,
wherein the copper alloy, when the alloy is
10 subjected to an aging treatment, shows a maximum peak of the tensile strength at a peak temperature of 350 to 600°C; and

wherein the alloy is overaged at a temperature between the peak temperature and 50°C above the peak
15 temperature.

13. A sheet of a copper alloy having a high-mechanical strength, the copper alloy comprising 3.0 to 4.5% by mass of Ni, 0.65 to 1.0% by mass of Si, 0.01 to
20 0.20% by mass of Mg, 0.05 to 1.5% by mass of Sn, 0.2 to 1.5% by mass of Zn, and less than 0.005% by mass (including 0% by mass) of S, with the balance being made of Cu and inevitable impurities,

wherein the alloy has a tensile strength of 800
25 N/mm² or more, and

wherein the alloy has a stress relaxation ratio of 10% or less.

14. A sheet according to claim 13, wherein the
5 copper alloy includes a crystal grain having a diameter from more than 0.001 mm to 0.025 mm.

15. A sheet according to claim 13, wherein the copper alloy has a ratio (a/b), between a longer diameter
10 a of a crystal grain on a cross section parallel to a direction of final plastic working, and a longer diameter b of a crystal grain on a cross section perpendicular to the direction of final plastic working, of 1.5 or less,

15 16. A sheet according to claim 13, wherein the ratio (a/b) is 0.8 or more.

17. A sheet according to claim 13, the copper alloy further comprising S at a content of less than
20 0.002% by mass.

18. A sheet according to claim 13, the copper alloy further comprising at least one selected from the group consisting of B, Fe, Zr, P, Mn, Ti, V, Pb, Bi and Al,
25 at a total content of 0.01 to 0.5% by mass.

19. A sheet according to claim 13, the copper alloy further comprising at least one selected from the group consisting of Ag, Co and Cr, at a total amount of
5 0.005 to 2.0% by mass.

20. A sheet according to claim 13, the copper alloy further comprising Ag at an amount of 0.005 to 0.3% by mass.
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21. A sheet according to claim 13, the copper alloy further comprising Co at an amount of 0.005 to 2.0% by mass.

22. A sheet according to claim 13, the copper alloy further comprising Cr, at an amount of 0.005 to 0.2% by mass.
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23. A sheet according to claim 13, wherein the
20 copper alloy is overaged.

24. A sheet according to claim 1,
wherein the copper alloy, when the alloy is subjected to an aging treatment, shows a maximum peak of
25 the tensile strength at a peak temperature of 350 to

600°C; and

wherein the alloy is overaged at a between the peak temperature and 50°C above the peak temperature.

5 25. A sheet of a copper alloy having a high-mechanical strength, the copper alloy comprising 3.0 to 4.5% by mass of Ni, 0.65 to 1.0% by mass of Si, 0.01 to 0.20% by mass of Mg, 0.05 to 1.5% by mass of Sn, 0.2 to 1.5% by mass of Zn, and less than 0.005% by mass
10 (including 0% by mass) of S, with the balance being made of Cu and inevitable impurities,

 wherein the copper alloy, when the alloy is subjected to an aging treatment, shows a maximum peak of the tensile strength at a peak temperature of 350 to
15 600°C; and

 wherein the alloy is overaged at a between the peak temperature and 50°C above the peak temperature.

26. A sheet according to claim 25, wherein the
20 copper alloy includes a crystal grain having a diameter from more than 0.001 mm to 0.025 mm.

27. A sheet according to claim 25, wherein the copper alloy has a ratio (a/b), between a longer diameter
25 a of a crystal grain on a cross section parallel to a

direction of final plastic working, and a longer diameter
b of a crystal grain on a cross section perpendicular to
the direction of final plastic working, of 1.5 or less,

5 28. A sheet according to claim 25, wherein the
ratio (a/b) is 0.8 or more.

 29. A sheet according to claim 25, the copper
alloy further comprising S at a content of less than
10 0.002% by mass.

 30. A sheet according to claim 25, the copper
alloy further comprising at least one selected from the
group consisting of B, Fe, Zr, P, Mn, Ti, V, Pb, Bi and Al,
15 at a total content of 0.01 to 0.5% by mass.

 31. A sheet according to claim 25, the copper
alloy further comprising at least one selected from the
group consisting of Ag, Co and Cr, at a total amount of
20 0.005 to 2.0% by mass.

 32. A sheet according to claim 25, the copper
alloy further comprising Ag at an amount of 0.005 to 0.3%
by mass.

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33. A sheet according to claim 25, the copper alloy further comprising Co at an amount of 0.005 to 2.0% by mass.

5 34. A sheet according to claim 25, the copper alloy further comprising Cr, at an amount of 0.005 to 0.2% by mass.

35. A sheet according to claim 25, wherein the
10 alloy has a stress relaxation ratio of 10% or less.

36. A sheet according to claim 25, wherein the alloy has a tensile strength of 800 N/mm² or more.

15 37. A sheet of a copper alloy having a high-mechanical strength, the copper alloy comprising 1.0 to 4.5% by mass of Ni, 0.2 to 1.0% by mass of Si, 0.01 to 0.20% by mass of Mg, 0.05 to 1.5% by mass of Sn, 0.2 to 1.5% by mass of Zn, and less than 0.005% by mass
20 (including 0% by mass) of S, with the balance being made of Cu and inevitable impurities,

wherein the copper alloy, when the alloy is subjected to an aging treatment, shows a maximum peak of the tensile strength at a peak temperature of 350 to
25 600°C; and

wherein the alloy is overaged at a between the peak temperature and 50°C above the peak temperature.

38. A sheet according to claim 37, wherein the
5 copper alloy includes a crystal grain having a diameter from more than 0.001 mm to 0.025 mm.

39. A sheet according to claim 37, wherein the
copper alloy has a ratio (a/b), between a longer diameter
10 a of a crystal grain on a cross section parallel to a direction of final plastic working, and a longer diameter b of a crystal grain on a cross section perpendicular to the direction of final plastic working, of 1.5 or less,

40. A sheet according to claim 37, wherein the
15 ratio (a/b) is 0.8 or more.

41. A sheet according to claim 37, the copper
alloy further comprising S at a content of less than
20 0.002% by mass.

42. A sheet according to claim 37, the copper
alloy further comprising at least one selected from the
group consisting of B, Fe, Zr, P, Mn, Ti, V, Pb, Bi and Al,
25 at a total content of 0.01 to 0.5% by mass.

43. A sheet according to claim 37, the copper alloy further comprising at least one selected from the group consisting of Ag, Co and Cr, at a total amount of
5 0.005 to 2.0% by mass.

44. A sheet according to claim 37, the copper alloy further comprising Ag at an amount of 0.005 to 0.3% by mass.
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45. A sheet according to claim 37, the copper alloy further comprising Co at an amount of 0.005 to 2.0% by mass.

46. A sheet according to claim 37, the copper alloy further comprising Cr, at an amount of 0.005 to 0.2% by mass.
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47. A sheet according to claim 37, wherein the
20 alloy has a stress relaxation ratio of 10% or less.

48. A sheet according to claim 37, wherein the alloy has a tensile strength of 800 N/mm^2 or more.